

420 Rec'd PCT/PTO 17 DEC 1999

## SEQUENCE LISTING

&lt;110&gt; SUNTORY LIMITED

&lt;120&gt; Gene encoding a protein having aurone synthesis activity

&lt;130&gt; G837

&lt;150&gt; JP 10-107296

&lt;151&gt; 1998-04-17

&lt;160&gt; 15

&lt;210&gt; 1

&lt;211&gt; 1951

&lt;212&gt; DNA

&lt;213&gt; Antirrhinum majus

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (96)...(1781)

&lt;223&gt; Nucleotide sequence encoding a protein having aurone synthesis activity

&lt;400&gt; 1

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aaattacatt gcttcctttg tcccaccttc caccaccaat atatacaact tcctcagcta    60
gttggtttatt atcaatcaaa taaaattatt tocca atg ttc aaa aat cct aat    113
                               Met Phe Lys Asn Pro Asn
                               1           5
atc cgc tat cac aaa cta tct tcc aaa tcc aat gac aac gat caa gaa    161
Ile Arg Tyr His Lys Leu Ser Ser Lys Ser Asn Asp Asn Asp Gln Glu
          10           15           20
tcc tcc cat cgt tgt aag cac att cta tta ttt ata ata acc tta ttc    209
Ser Ser His Arg Cys Lys His Ile Leu Leu Phe Ile Ile Thr Leu Phe
          25           30           35

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cta ctt ata gtt ggc ctg tac atc gcc aac tct ctc gcc tat gcc cgg	257
Leu Leu Ile Val Gly Leu Tyr Ile Ala Asn Ser Leu Ala Tyr Ala Arg	
40 45 50	
ttt gcc tcg acc tca acc ggc cct atc gcc gcc cct gat gtc acc aaa	305
Phe Ala Ser Thr Ser Thr Gly Pro Ile Ala Ala Pro Asp Val Thr Lys	
55 60 65 70	
tgt ggt cag cca gac ttg cca cct ggc aca gcc cca ata aac tgt tgt	353
Cys Gly Gln Pro Asp Leu Pro Pro Gly Thr Ala Pro Ile Asn Cys Cys	
75 80 85	
ccc cca atc ccc gct aaa atc atc gat ttc gag cta cca cct ccc tcc	401
Pro Pro Ile Pro Ala Lys Ile Ile Asp Phe Glu Leu Pro Pro Pro Ser	
90 95 100	
act acc atg agg gtt cgc cgt gcg gct cat tta gtt gat gat gca tac	449
Thr Thr Met Arg Val Arg Arg Ala Ala His Leu Val Asp Asp Ala Tyr	
105 110 115	
att gcc aaa ttc aag aaa gcc gtt gag ctt atg cga gct cta cct gag	497
Ile Ala Lys Phe Lys Lys Ala Val Glu Leu Met Arg Ala Leu Pro Glu	
120 125 130	
gat gac cct cgt agc ttc aag caa caa gct aac gtc cat tgc gct tac	545
Asp Asp Pro Arg Ser Phe Lys Gln Gln Ala Asn Val His Cys Ala Tyr	
135 140 145 150	
tgc gcg ggg gcg tat aat caa gcc ggt ttc aca aac cta aag ctc caa	593
Cys Ala Gly Ala Tyr Asn Gln Ala Gly Phe Thr Asn Leu Lys Leu Gln	
155 160 165	
atc cac cga tct tgg ctt ttt ttc ccg ttc cat aga tat tat atc tac	641
Ile His Arg Ser Trp Leu Phe Phe Pro Phe His Arg Tyr Tyr Ile Tyr	
170 175 180	
ttt ttt gaa aga ata ttg gga aaa cta atc aat gat aca act ttt gct	689
Phe Phe Glu Arg Ile Leu Gly Lys Leu Ile Asn Asp Thr Thr Phe Ala	
185 190 195	
ctc cca ttt tgg aac tat gat tca cct ggt gga atg aca atc cca tca	737
Leu Pro Phe Trp Asn Tyr Asp Ser Pro Gly Gly Met Thr Ile Pro Ser	
200 205 210	
atg ttt att gat act aat tct tcg ctg tac gat agt tta cgg gac agt	785
Met Phe Ile Asp Thr Asn Ser Ser Leu Tyr Asp Ser Leu Arg Asp Ser	
215 220 225 230	
aat cat cag cca cca acc atc gta gac ttg aac tac gcc ttt tct gat	833
Asn His Gln Pro Pro Thr Ile Val Asp Leu Asn Tyr Ala Phe Ser Asp	
235 240 245	

tcc gac aat acc act act cct gaa gag caa atg att ata aac ctt aaa	881
Ser Asp Asn Thr Thr Thr Pro Glu Glu Gln Met Ile Ile Asn Leu Lys	
250 255 260	
att gtg tac aga caa atg gtg tcg agc gct aag act cca cag ctt ttc	929
Ile Val Tyr Arg Gln Met Val Ser Ser Ala Lys Thr Pro Gln Leu Phe	
265 270 275	
ttc ggc cgc cca tac cga cgt ggg gac caa gag ttt ccc ggg gtg ggg	977
Phe Gly Arg Pro Tyr Arg Arg Gly Asp Gln Glu Phe Pro Gly Val Gly	
280 285 290	
tcg att gag tta gtc cct cat ggc atg ata cat tta tgg acc ggt tct	1025
Ser Ile Glu Leu Val Pro His Gly Met Ile His Leu Trp Thr Gly Ser	
295 300 305 310	
gag aac acg ccc tat ggc gag aac atg ggg gct ttc tac tca acg gct	1073
Glu Asn Thr Pro Tyr Gly Glu Asn Met Gly Ala Phe Tyr Ser Thr Ala	
315 320 325	
aga gac ccg ata ttt ttt gct cat cat tcg aac gtc gat aga atg tgg	1121
Arg Asp Pro Ile Phe Phe Ala His His Ser Asn Val Asp Arg Met Trp	
330 335 340	
tcc ata tgg aag acc cta gga ggg ccg ccg agg acg gac tta aca gat	1169
Ser Ile Trp Lys Thr Leu Gly Gly Pro Arg Arg Thr Asp Leu Thr Asp	
345 350 355	
cca gat ttt ctt gat gcg tct ttc gtt ttt tat gac gaa aac gca gag	1217
Pro Asp Phe Leu Asp Ala Ser Phe Val Phe Tyr Asp Glu Asn Ala Glu	
360 365 370	
atg gtt ccg gtc aag gtt ccg gat tgc tta gat gaa aag aaa cta ggg	1265
Met Val Arg Val Lys Val Arg Asp Cys Leu Asp Glu Lys Lys Leu Gly	
375 380 385 390	
tac gtt tat caa gat gtg gag att ccg tgg ctc aac act cgt cca aca	1313
Tyr Val Tyr Gln Asp Val Glu Ile Pro Trp Leu Asn Thr Arg Pro Thr	
395 400 405	
cca aaa gtt tct ccg tct cta ctt aag aaa ttt cat aga aca aac act	1361
Pro Lys Val Ser Pro Ser Leu Leu Lys Lys Phe His Arg Thr Asn Thr	
410 415 420	
gcc aat ccg aga caa gtt ttt cct gcg ata ctt gac aga gtc tta aaa	1409
Ala Asn Pro Arg Gln Val Phe Pro Ala Ile Leu Asp Arg Val Leu Lys	
425 430 435	
gtt atc gtg acg agg ccg aag aaa act aga agt agg aaa gaa aag gac	1457
Val Ile Val Thr Arg Pro Lys Lys Thr Arg Ser Arg Lys Glu Lys Asp	
440 445 450	

gag tta gaa gag att tta gtg att gaa ggg att gaa ctg gaa aga gac 1505  
 Glu Leu Glu Glu Ile Leu Val Ile Glu Gly Ile Glu Leu Glu Arg Asp  
 455 460 465 470  
 cac ggg cac gta aaa ttc gac gtt tat att aat gct gac gaa gat gac 1553  
 His Gly His Val Lys Phe Asp Val Tyr Ile Asn Ala Asp Glu Asp Asp  
 475 480 485  
 ott gcg gtg att tcg ccg gag aat gct gag ttc gcc ggg agt ttc gtg 1601  
 Leu Ala Val Ile Ser Pro Glu Asn Ala Glu Phe Ala Gly Ser Phe Val  
 490 495 500  
 agt ctg tgg cac aaa cct ata aag ggg aag agg aca aag acg cag tta 1649  
 Ser Leu Trp His Lys Pro Ile Lys Gly Lys Arg Thr Lys Thr Gln Leu  
 505 510 515  
 tta aca ttg tcg att tgt gat att ttg gag gat ttg gat gct gac gaa 1697  
 Leu Thr Leu Ser Ile Cys Asp Ile Leu Glu Asp Leu Asp Ala Asp Glu  
 520 525 530  
 gat gat tat gtg ttg gtc act ttg gtt ccg aga aac gcc gga gat gcg 1745  
 Asp Asp Tyr Val Leu Val Thr Leu Val Pro Arg Asn Ala Gly Asp Ala  
 535 540 545 550  
 atc aag att cat aat gtc aag att gag ctt gat ggc taataaatc 1791  
 Ile Lys Ile His Asn Val Lys Ile Glu Leu Asp Gly  
 555 560 562  
 tattgatttc ttctcaacct acagttgatc atttaaccgat tgattattcc aataaaagta 1851  
 totcatgtac caatatcgat cgtattaatc gtaataacttt cagattttta tttattttaa 1911  
 agcagttgta taaatggtga aataaggatt acttttttgag 1951

<210> 2

<211> 562

<212> PRT

<213> Antirrhinum majus

<220>

<223> Amino acid sequence of a protein having aurone  
synthesis activity

<400> 2

Met Phe Lys Asn Pro Asn Ile Arg Tyr His Lys Leu Ser Ser Lys Ser  
 1 5 10 15

Asn	Asp	Asn	Asp	Gln	Glu	Ser	Ser	His	Arg	Cys	Lys	His	Ile	Leu	Leu
				20				25					30		
Phe	Ile	Ile	Thr	Leu	Phe	Leu	Leu	Ile	Val	Gly	Leu	Tyr	Ile	Ala	Asn
				35				40				45			
Ser	Leu	Ala	Tyr	Ala	Arg	Phe	Ala	Ser	Thr	Ser	Thr	Gly	Pro	Ile	Ala
				50				55				60			
Ala	Pro	Asp	Val	Thr	Lys	Cys	Gly	Gln	Pro	Asp	Leu	Pro	Pro	Gly	Thr
				65				70			75				80
Ala	Pro	Ile	Asn	Cys	Cys	Pro	Pro	Ile	Pro	Ala	Lys	Ile	Ile	Asp	Phe
								85			90			95	
Glu	Leu	Pro	Pro	Pro	Ser	Thr	Thr	Met	Arg	Val	Arg	Arg	Ala	Ala	His
								100			105			110	
Leu	Val	Asp	Asp	Ala	Tyr	Ile	Ala	Lys	Phe	Lys	Lys	Ala	Val	Glu	Leu
								115			120			125	
Met	Arg	Ala	Leu	Pro	Glu	Asp	Asp	Pro	Arg	Ser	Phe	Lys	Gln	Gln	Ala
								130			135			140	
Asn	Val	His	Cys	Ala	Tyr	Cys	Ala	Gly	Ala	Tyr	Asn	Gln	Ala	Gly	Phe
								145			150			155	160
Thr	Asn	Leu	Lys	Leu	Gln	Ile	His	Arg	Ser	Trp	Leu	Phe	Phe	Pro	Phe
								165			170			175	
His	Arg	Tyr	Tyr	Ile	Tyr	Phe	Phe	Glu	Arg	Ile	Leu	Gly	Lys	Leu	Ile
								180			185			190	
Asn	Asp	Thr	Thr	Phe	Ala	Leu	Pro	Phe	Trp	Asn	Tyr	Asp	Ser	Pro	Gly
								195			200			205	
Gly	Met	Thr	Ile	Pro	Ser	Met	Phe	Ile	Asp	Thr	Asn	Ser	Ser	Leu	Tyr
								210			215			220	
Asp	Ser	Leu	Arg	Asp	Ser	Asn	His	Gln	Pro	Pro	Thr	Ile	Val	Asp	Leu
								225			230			235	240
Asn	Tyr	Ala	Phe	Ser	Asp	Ser	Asp	Asn	Thr	Thr	Thr	Pro	Glu	Glu	Gln
								245			250			255	
Met	Ile	Ile	Asn	Leu	Lys	Ile	Val	Tyr	Arg	Gln	Met	Val	Ser	Ser	Ala
								260			265			270	
Lys	Thr	Pro	Gln	Leu	Phe	Phe	Gly	Arg	Pro	Tyr	Arg	Arg	Gly	Asp	Gln
								275			280			285	
Glu	Phe	Pro	Gly	Val	Gly	Ser	Ile	Glu	Leu	Val	Pro	His	Gly	Met	Ile
								290			295			300	
His	Leu	Trp	Thr	Gly	Ser	Glu	Asn	Thr	Pro	Tyr	Gly	Glu	Asn	Met	Gly
								305			310			315	320

Ala Phe Tyr Ser Thr Ala Arg Asp Pro Ile Phe Phe Ala His His Ser		
325	330	335
Asn Val Asp Arg Met Trp Ser Ile Trp Lys Thr Leu Gly Gly Pro Arg		
340	345	350
Arg Thr Asp Leu Thr Asp Pro Asp Phe Leu Asp Ala Ser Phe Val Phe		
355	360	365
Tyr Asp Glu Asn Ala Glu Met Val Arg Val Lys Val Arg Asp Cys Leu		
370	375	380
Asp Glu Lys Lys Leu Gly Tyr Val Tyr Gln Asp Val Glu Ile Pro Trp		
385	390	395
Leu Asn Thr Arg Pro Thr Pro Lys Val Ser Pro Ser Leu Leu Lys Lys		
405	410	415
Phe His Arg Thr Asn Thr Ala Asn Pro Arg Gln Val Phe Pro Ala Ile		
420	425	430
Leu Asp Arg Val Leu Lys Val Ile Val Thr Arg Pro Lys Lys Thr Arg		
435	440	445
Ser Arg Lys Glu Lys Asp Glu Leu Glu Glu Ile Leu Val Ile Glu Gly		
450	455	460
Ile Glu Leu Glu Arg Asp His Gly His Val Lys Phe Asp Val Tyr Ile		
465	470	475
Asn Ala Asp Glu Asp Asp Leu Ala Val Ile Ser Pro Glu Asn Ala Glu		
485	490	495
Phe Ala Gly Ser Phe Val Ser Leu Trp His Lys Pro Ile Lys Gly Lys		
500	505	510
Arg Thr Lys Thr Gln Leu Leu Thr Leu Ser Ile Cys Asp Ile Leu Glu		
515	520	525
Asp Leu Asp Ala Asp Glu Asp Asp Tyr Val Leu Val Thr Leu Val Pro		
530	535	540
Arg Asn Ala Gly Asp Ala Ile Lys Ile His Asn Val Lys Ile Glu Leu		
545	550	555
Asp Gly		
562		

<210> 3

<211> 13

<212> PRT

<213> Antirrhinum majus

<220>

<223> Partial amino acid sequence of a protein having  
aurone synthesis activity

<400> 3

Lys Lys Leu Gly Tyr Val Tyr Gln Asp Val Glu Ile Pro  
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<210> 4

<211> 12

<212> PRT

<213> Antirrhinum majus

<220>

<223> Partial amino acid sequence of a protein having  
aurone synthesis activity

<400> 4

Lys Ile Val Tyr Arg Gln Met Val Ser Ser Ala Lys  
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<210> 5

<211> 18

<212> PRT

<213> Antirrhinum majus

<220>

<223> Partial amino acid sequence of a protein having  
aurone synthesis activity

<400> 5

Lys Thr Pro Gln Leu Phe Phe Gly Arg Pro Tyr Arg Arg Gly Asp Gln  
5 10 15  
Glu Phe

<210> 6

<211> 30

<212> PRT

<213> Antirrhinum majus

<220>

<221> UNSURE

<222> (9)

<220>

<221> UNSURE

<222> (29)

<223> Partial amino acid sequence of a protein having  
aurone synthesis activity

<400> 6

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Arg	Arg	Ala	Ala	His	Leu	Val	Asp	Asp	Ala	Tyr	Ile	Xaa	Lys		
					20				25					30	

<210> 7

<211> 125

<212> PRT

<213> Antirrhinum majus

<220>

<223> Partial amino acid sequence of a protein having  
aurone synthesis activity

<400> 7

Arg	Gln	Met	Val	Ser	Ser	Ala	Lys	Thr	Pro	Gln	Leu	Phe	Phe	Gly	Arg
						5				10				15	
Pro	Tyr	Arg	Arg	Gly	Asp	Gln	Glu	Phe	Pro	Gly	Val	Gly	Ser	Ile	Glu
						20				25				30	
Leu	Val	Pro	His	Gly	Met	Ile	His	Leu	Trp	Thr	Gly	Ser	Glu	Asn	Thr
						35				40				45	
Pro	Tyr	Gly	Glu	Asn	Met	Gly	Ala	Phe	Tyr	Ser	Thr	Ala	Arg	Asp	Pro
						50				55				60	
Ile	Phe	Phe	Ala	His	His	Ser	Asn	Val	Asp	Arg	Met	Trp	Ser	Ile	Trp
						65				70				75	80



Lys Thr Leu Gly Gly Pro Arg Arg Thr Asp Leu Thr Asp Pro Asp Phe  
                                     85                                    90                                    95  
 Leu Asp Ala Ser Phe Val Phe Cys Asp Glu Asn Ala Glu Met Val Arg  
                                     100                                    105                                    110  
 Val Lys Val Arg Asp Cys Leu Asp Gly Lys Lys Leu Gly  
                                     115                                    120                                    125

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 <213> Artificial Sequence

<220>  
 <221>  
 <222> (2)  
 <223> Xaa is Val or Ile

<400> 8  
 Phe Xaa Lys Phe Thr Ala Ile  
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<210> 9  
 <211> 6  
 <212> PRT  
 <213> Artificial Sequence

<220>  
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 <222> (6)  
 <223> Xaa is Thr or Pro

<400> 9  
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<210> 10  
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<212> PRT

<213> Artificial Sequence

<220>

<221>

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<400> 10

His Ala Val Cys Asn Glu

5

<210> 11

<211> 20

<212> DNA

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<221>

<222>

<223> Primer

<400> 11

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<210> 12

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<212> DNA

<213> Artificial Sequence

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<223> Primer

<400> 12

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<210> 13  
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<212> DNA  
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18

<210> 14  
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20

<210> 15  
<211> 22  
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<221>  
<222>  
<223> Primer

~~400~~ 15

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22

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